Input Contribution XX

28- Feb -2022

Input Contribution to EACO

Online meeting 17-18 August 2021

GSOA

Agenda Item 1.3

Clarifications on the scope of the Agenda Item 1.3 and on the FSS usage in Africa

Part A: Description

In accordance to Resolution 246 (WRC-19) the aim of Agenda Item 1.3 is to conduct "*Studies to consider possible allocation of the frequency band 3 600-3 800 MHz to the mobile, except aeronautical mobile service, on a primary basis within Region 1.*"

Resolution 246 (WRC-19) recognizes that **for African countries, especially those in tropical areas, the operations of FSS systems are more reliable for use in at C-band frequencies** (3 400-4 200 MHz), rather than in higher frequency bands.

Resolution 246 (WRC-19) also calls to ensure protection of those services to which the frequency band is allocated on a primary basis and **not impose undue constraints on the existing services and their future development**.

It is important to note that this agenda item **only seeks to upgrade the existing secondary mobile allocation in the frequency band 3 600-3 800 MHz to primary in Region 1, excluding in any case any IMT identification in Region 1**, which would not be within the mandate of WP 5A.

Part B: Key Elements – the notables

It is critical to note how **the extent of C-band FSS deployment and type of FSS use varies greatly within Region 1**. Whereas in majority of CEPT countries C-band FSS deployment is represented by a limited number of relatively large and professionally installed earth stations at known locations, in Africa the reliance on C-band FSS services is more profound and pervasive with thousands of earth stations. Protection of such high number of earth station would not allow for a widescale outdoor MS deployment.

In light of the deployment scenario and the nature of the services, studies conducted by the ITU-R in the previous study cycles (ITU-R reports M.2109 & S.2368), as well as several studies performed by both the mobile industry and the satellite industry, clearly indicate that **co-frequency sharing, is neither feasible nor practical between mobile service and fixed satellite service (FSS) within C-band**.

<u>Difference between MS and IMT:</u>

Through this contribution, GSOA wishes to highlight that WRC-19 decided for Agenda Item 1.3 to be under the responsibility of WP 5A. That is because Agenda Item 1.3 is solely concerning the potential elevation to primary allocation of Mobile Service in 3600-3800 MHz, without contemplating any specific IMT identification. In fact, GSOA wishes to highlight how allocation does not automatically imply identification (i.e. for example, there are specific Agenda Items for for IMT identification such as Agenda Item 1.2 (WRC-23) for Region 2, where MS has primary allocation status already). A further proof not to interchangeably use the terms "allocation" and "identification" is in the mandate of WP 5A itself: *"WP 5A is responsible for studies related to the land mobile*

service, excluding IMT and including wireless access in the fixed service, and is also responsible for studies related to the amateur and amateur-satellite services."

Difference in usage within Region 1:

3600-3800 MHz usage – and consequent terminal deployment – in Region 1 varies greatly across the continents. While in Europe this band is used for very few well-known locations (i.e. a small number of specific teleports), in Africa we can observe ubiquitous FSS deployment, also providing direct-to-consumer services, with over 50 C-band GSO satellites serving the continent and further investments planned. In light of this fundamental difference, GSOA recommends assessing any intended outcome of this Agenda Item by evaluating the impact upon each continent, without necessarily replicating conclusions reached by other territories.

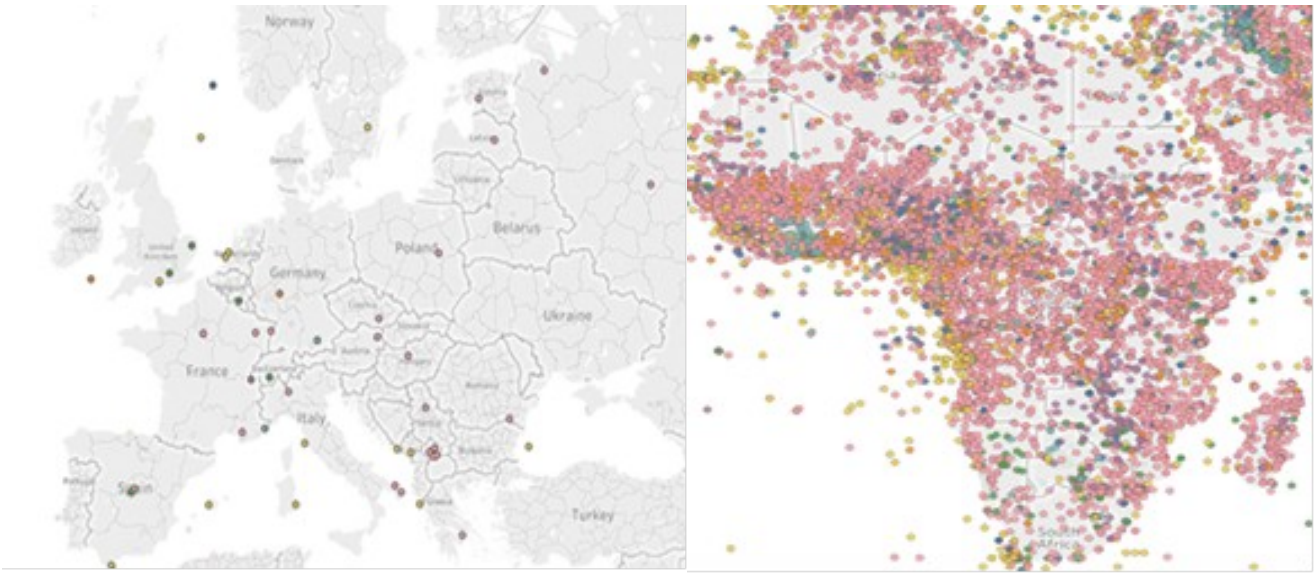

Figure 1: FSS teleports in few, well-known, locations (Europe) Ubiquitous FSS deployment, providing services such e.g. direct-to-home (Africa)

It is clear from this figure above that Africa has a high density of C-band FSS Earth stations, compared to other regions (e.g. within Europe C-band deployment is different from Africa in the sense that in Europe most of the downlink in C-band is for business to business (B to B) towards major teleports which are historically located in remote regions and crucially have a known geographical location). This limited number of earth stations has made it possible to allow C-Band spectrum to be used for terrestrial mobile services. This situation is not comparable to Africa, where the number of earth stations is very much different and delivers business to consumers (B to C) applications.

It is also important to note that the existing sharing studies are based on protection of an FSS ES at known locations and does not address ubiquitous or license exempt un-registered FSS receiving earth station deployment delivering services directly to consumers e.g. direct-to-home (DTH). Such deployment cannot be protected based on geographical separation but other protection measures, such as frequency separation, are required.

Also, we recognize that demand for mobile data is rising rapidly, and that requirements for spectrum may change over time, but Mobile transmitters do not exist in solitude, they are part of a wider network and EACO needs to consider how multiple Mobile transmitters will impact satellite reception that has provided critical services for decades and continuing to do so inside EACO region. Therefore, we would like to suggest, as an alternative, that EACO consider the 100 MHz within the lightly used 3.3-3.4 GHz band, instead of the 3.6-3.8 GHz band, in order to provide 300 of mid-band spectrum, to Mobile Network Operators (MNOs). This action

would allow satellite services to continue operating above 3.6 GHz and enable better harmonisation and cross-border coordination as 33 African members (including EACO countries) already adopted Footnote 5.429B of the ITU Radio Regulations granting the use of the 3.3-3.4 GHz band for IMT.

Countries (in red) in Africa which have identified the frequency range 3300 – 3400 MHz

Mobile service C-band planned use:

The mobile industry commonly estimates that 80 to 100 MHz per MNO would be required. In the response to claims by some MNOs that they need access to at least 80 MHz of contiguous spectrum, Ofcom, the communications regulator in the United Kingdom, researched the ability of mobile operators to launch 5G services with 40 MHz of spectrum. Such research found that "(…) there was no evidence that 5G could not be delivered with smaller [e.g. 40 MHz blocks] or non-contiguous carriers in other frequency bands [i.e. spectrum other than C-band]." To support its finding that 40 MHz of C-band spectrum was sufficient to provide 5G services, Ofcom developed a theoretical cell site throughput model to estimate network performance based on various assumptions on the type of antenna used, bandwidth of C-band carrier, and signal strength received by the user. The results clearly demonstrate that terrestrial mobile operators will be able to deliver all the main services anticipated under 5G – including, but not limited to, connected cars, virtual reality cloud broadband, and live 4K streaming – with 40 MHz of spectrum.

Figures 1 and 2 shows that results of Ofcom studies clearly demonstrate that mobile operators will be able to provide all the main services provided for in the 5G - including, among others, connected cars, broadband in the virtual reality cloud and streaming to live in 4K - with 40 MHz of spectrum. Mobile operators may want an 80 to 100 MHz spectrum from the C-band for optimal performance, but they don't need it to offer high quality to remain competitive. In other words, most benefits arising from the implementation of 5G services, both for the economy and for consumers, will be obtained through the deployment by each MNOs of the first 40 MHz of the spectrum of the Band C, with the deployment of any additional spectrum up to 100 MHz that they they can acquire would only bring incremental benefits.

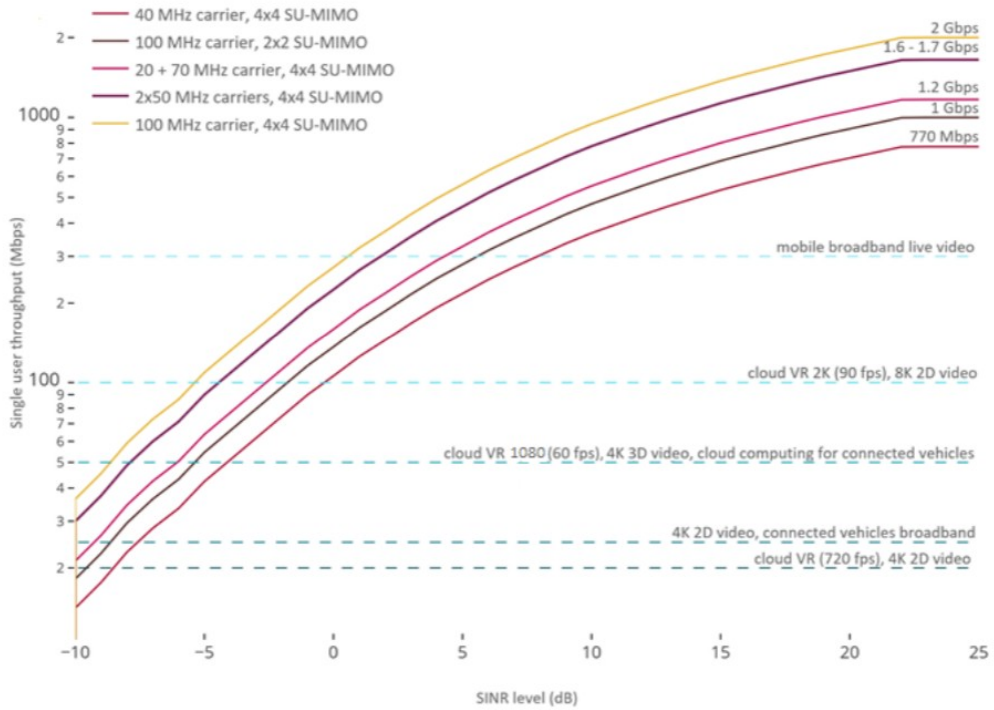

Figure 1. Downlink throughput for a single user (SUT) across different signal levels in a cell compared to the minimum rate required for some 5G services[1]

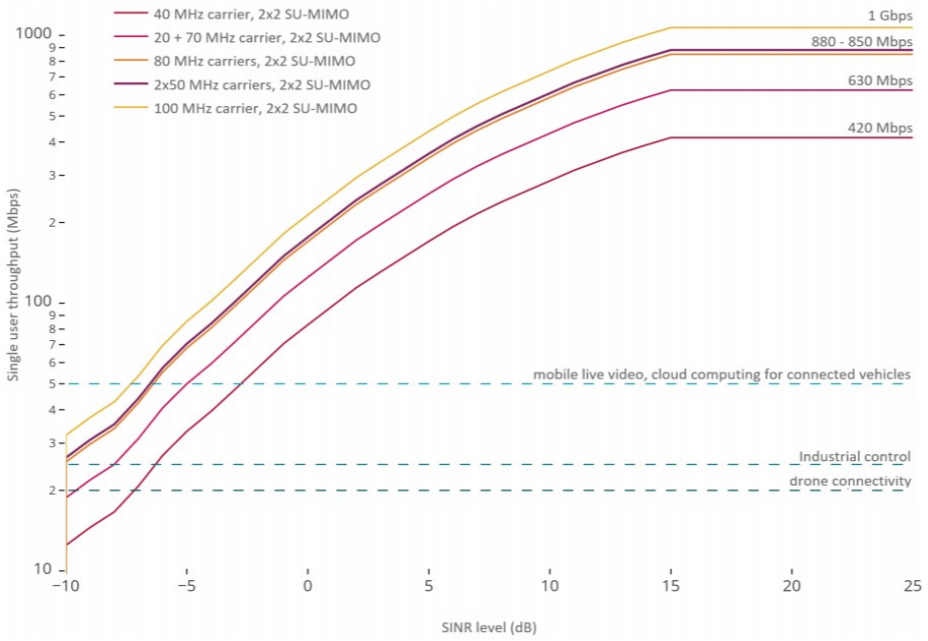

Figure 2. Downlink throughput for a single user (SUT) across different signal levels in a cell compared to the minimum rate required for some 5G services[2]

[1] *See*, Ofcom, *Figure A7.26*, *Award of the 700 MHz and 3.6-3.8 GHz spectrum bands: Annexes* (13 March 2020), available online at https://www.ofcom.org.uk/data/assets/pdf_file/0017/192410/annexes-award-700mhz-3.6-3.8ghz-spectrum.pdf.
[2] *See*, Ofcom, *Figure A7.27*, *Award of the 700 MHz and 3.6-3.8 GHz spectrum bands: Annexes* (13 March 2020), available online at https://www.ofcom.org.uk/data/assets/pdf_file/0017/192410/annexes-award-700mhz-3.6-3.8ghz-spectrum.pdf.

In addition, these mobile deployments in C-band are solely aimed at urbanized areas, already well connected with terrestrial infrastructure. It is also expected for these mobile deployments to take time as requiring important investments and consequent infrastructure development. It is estimated that the cost "to achieve universal broadband via terrestrial 4G infrastructure (delivering at least 10 Mbps) in developing countries" would be around 2 trillion.[3] It is therefore important to highlight that mobile service will likely take time and focus on already well connected areas where less investments are required to deploy mobile stations.

Part C: Current Status of Band

- FSS (space-to-Earth) is primary in the band, together with Fixed Services.
- Mobile Services are currently secondary in R1 and looking to be allocated to primary in the 3600-3800 GHz band.

Allocation to services		
Region 1	**Region 2**	**Region 3**
3 400-3 600 MHz FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.430A Radiolocation 5.431	**3 500-3 600 MHz** FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.431B Radiolocation 5.433	**3 500-3 600 MHz** FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.433A Radiolocation 5.433
3 600-4 200 MHz FIXED FIXED-SATELLITE (space-to-Earth) Mobile *Possible elevation of mobile service to primary in the 3 600-3 800 MHz range in Region 1*	**3 600-3 700 MHz** FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.434 Radiolocation 5.433	**3 600-3 700 MHz** FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile Radiolocation 5.435
	3 700-4 200 MHz FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile	**3 700-4 200 MHz** FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile

Part D: Conclusion of the results of studies, if any

The coexistence of mobile services with fixed satellite Existing studies between FSS and MS (also considering IMT parameters for the sake of completeness) in this frequency band were included in Report ITU-R S.2368, which concludes that **"For the long-term interference criterion, the required separation distances are at least in the tens of km. For the short-term interference criterion, the required separation distances, including when the effects of terrain are taken into account, exceed 100 km for most of the cases."** ITU-R Report M.2109 reaches similar conclusions were drawn with separation distances of tens and hundreds of km for long- and short-term protection criteria respectively. Furthermore, the FSS protection criteria should be used to determine the necessary separation distances to ensure protection of the existing and planned FSS earth stations. Further studies are being conducted for this WRC-23 study cycle, which have to take into account in-band and out-of-band interference scenarios. Two studies were presented at the 26th WP5A meeting November 2021:

- Contribution 5A/443 from 7 African administrations (Burkina Faso, Côte d'Ivoire, Ghana, Guinea, Mali, Niger and Togo) presenting single entry and aggregate studies with separation distance results in line

[3] (25) Lessons Learned from Modelling Global Affordable 4G and 5G Universal Broadband Strategies | LinkedIn

with existing ITU-R studies S.2368 and M.2109.

- Contribution 5A/457 from 3 administrations (Nigeria, South Africa, Zimbabwe) presenting an aggregate interference analysis with separation distances of 4-5km for both long and short term FSS protection criteria.

Results from Nigeria, South Africa, Zimbabwe heavily questioned as inconsistent with existing knowledge of FSS and MS sharing. The results presented are 10 to 50 times shorter from existing study reports ITU-R M.2109 and S.2368. In addition, if these results were accurate, MS and FSS sharing would be feasible which is completely the opposite of the reality of the issue with sharing between the two services being one of the most complex issue to deal with for administrations.

A contribution was also sent 5A/444 by Niger, Ghana and Guinea on the need to come to an agreement on the adjacent protection criteria by proposing a compromise value of I/N=-15.5 dB not be exceeded for more than 20% time. No agreement was reached with some administrations and the mobile community still pushing for the adjacent band protection criteria to be identical to the in-band protection criteria (I/N = -10.5 dB for no more than 20% time) and are unwilling to compromise.

Part E: Options and Associated Implications

There is a need to recognize that the intensity of C-band FSS deployments varies region to region, and country to country. These differences are based on many factors including the existing communications infrastructure in each country, geography, and climate. The mobile industry has expressed great interest in displacing satellite users from the C-band spectrum. This interest in C-band has only intensified. Regulators now have to make tough decisions about how spectrum should be allocated. ATU regulators must balance all these technical and economic factors before making any decisions.

Implication:
Mobile systems can cause interference to FSS earth stations operating in the band 3 600-3 800 MHz within a distance up to 10s and 100s of kilometres.[4]

Also, Mobile signals can interfere with FSS receivers operating in the band above 3 800 MHz in two ways:

1. Saturate the LNB of the earth station – even when the Mobile signal is adjacent to the satellite signal
2. Out-of-Band-Emissions (OOBE) of the Mobile signal can cause in-band interference to FSS signal

Overall, existing studies within ITU-R, indicate that the fixed-satellite service and the mobile service are not compatible. The long-term use of this band for FSS systems in Africa would be facilitated by No Change to the RR under this agenda item.

[4] ITU-R Reports M.2109, S.2368 present a number of studies that lead to these results. In addition a comparative report of numerous studies was developed by LS Telcom: C-band_compatibility_report.pdf (lstelcom.com)

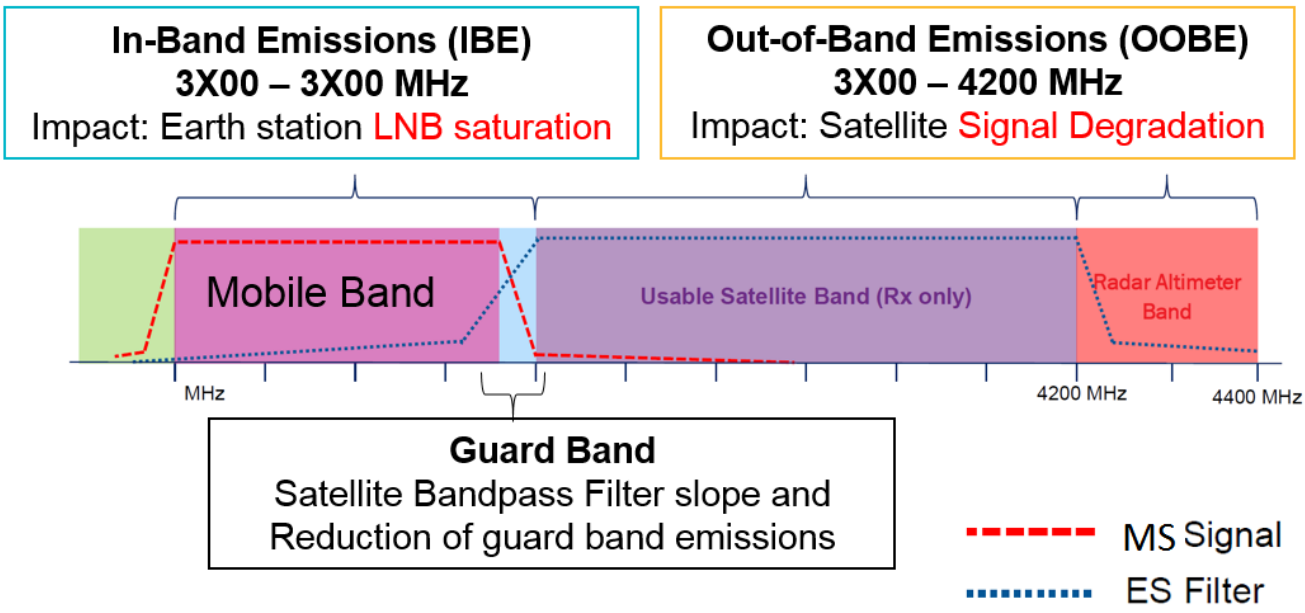

Figure 2: Impact of Introducing Mobile services adjacent to FSS

As shown in Figure 2, ATU Administrations are urged to take necessary steps if introducing mobile service in bands adjacent to FSS (i.e. MS in 3.4-3.6 GHz and FSS in 3.6-4.2 GHz). For example, for the filter to operate properly it is necessary to have a guard band between the edge of the MS transmission and the FSS transmission to provide the waveguide filter the necessary bandwidth to reject the MS interference at the earth station. The width of the guard band will depend on several factors and these are addressed on the following page.

The implications of these interference mechanisms are that the FSS receiving ES would not be able to operate in the same geographical areas co-frequency. Mobile systems using the C-band are aimed to be used solely in urbanized areas. The consequence of the introduction of mobile systems in the 3.6-3.8 GHz in urban would be the inability of operating FSS in the band and therefore removing C-band capacity for rural connectivity solutions to favor urban environments, further increasing the already important digital divide in Africa. The arguments raised above clearly show that the 3.3-3.4 GHz band could a good alternative to 3.6-3.8 GHz band, providing an additional 100 MHz to the 3.4-3.6 GHz band and facilitating sharing conditions with existing services.

Part F: Proposed African Common View and/or Position

While significant progress has been made in Africa in the past years, the average amount of spectrum licensed to mobile services in the region today is only 477 MHz[5], which is well under 50% of the spectrum that is regionally harmonized for mobile service use. This leaves typically 500-700 MHz of spectrum that has yet to be licensed.

ESOA recommends to assess the usage of alternative mid-band spectrum for MS in the various African country first, especially where MS is already primary and where the band is under-utilized, so to promote the MS use of those bands while preserving FSS usage in the 3600-3800 MHz. It is also clear that mobile services in the 3.6-3.8 GHz are only planned for metro-city areas and are not aimed to provide rural coverage. The implication of such an elevation of the mobile service to a primary allocation in 3.6-3.8 GHz could lead to a general migration of FSS services, reducing FSS capacity and its capacity to bridge the digital divide in Africa. This would in fact deepen the divide by favoring further urban deployments and vacating rural applications from the bands.

[5] https://www.lstelcom.com/fileadmin/content/lst/marketing/media/2019_Study_LicensingUseofMobileSpectrum.pdf

Part G: Recommendations and Way Forward

Recognizing the importance of the 3600-3800 MHz band and of the C-band in general for FSS for the African continent, it is recommended that African Administration participating in the work of ITU-R Working Party 5A, as the Responsible Group, and Working Parties 3K, 3M, 4A, 5B, 5C and 5D, as Interested Groups, and make it clear that existing ITU studies show that the fixed-satellite service and the mobile service are not compatible.

Furthermore Africa can also develop up to date studies (similar to what ECOWAS has done) to demonstrate the large geographical separation distances required, the results of which can then be presented in future ITU meetings, and that resources should not be wasted on further studies as the agenda item requires protection of the existing services.

The 3.3-3.4 GHz band should be seriously considered as an alternative spectrum band for the implementation of mobile services before contemplating the 3.6-3.8 GHz which raises a number of coexistence issues with existing core services in Africa.

Part H: Other Regional Groups and international organizations preliminary positions or positions

Preliminary APT Position:

- Willing to support a primary MS allocation in Region 1, as long as it does not have any adverse effects on the regulatory framework in Region 3.

Preliminary CITEL Position:

- Support studies to consider the MS primary allocation in Region 1, as long as it does not have any adverse effects on the regulatory framework in Region 2.

Preliminary ASMG Position:

- In favour of MS primary allocation in this band.

Preliminary RCC Position:

- in favour of the protection of FSS, FS and other services operating in the frequency band 3 600-3 800 MHz and in adjacent frequency bands, without imposing undue constraints on these services and their further development.

Preliminary CEPT Position:

- Still under discussion.